# Status of the Trigger Simulation

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ADM March 30, 2001

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# Introduction

- L1/L2 and L3 can be run from separate packages: tsim_l1l2 and tsim_l3. These are mainly for developers.

- The main package for users to run the trigger simulation is called d0trigsim (calls L1/L2/L3).

- Production release has existed and has been tested for nearly two months (p06.00.01).

- Standard output is to ROOT tree with a branch for each "subsystem".

- Web address:

  `http://www-d0.fnal.gov/computing/trigsim/trigsim.html`

# Status of p06.00.01

- Started production release cycle in November, retrofitted L3 code into it in January and finished it in February.

- First real production release of trigger simulator (contains working L1 and L2 and L3!)

- Should read datafiles containing only Raw Data Chunk and Cal Trigger Tower Chunk...no digi-chunks required!

- Has been run on many 10s of thousands of events by physics groups without crashing....but good datafiles are missing and some distributions are "funny".
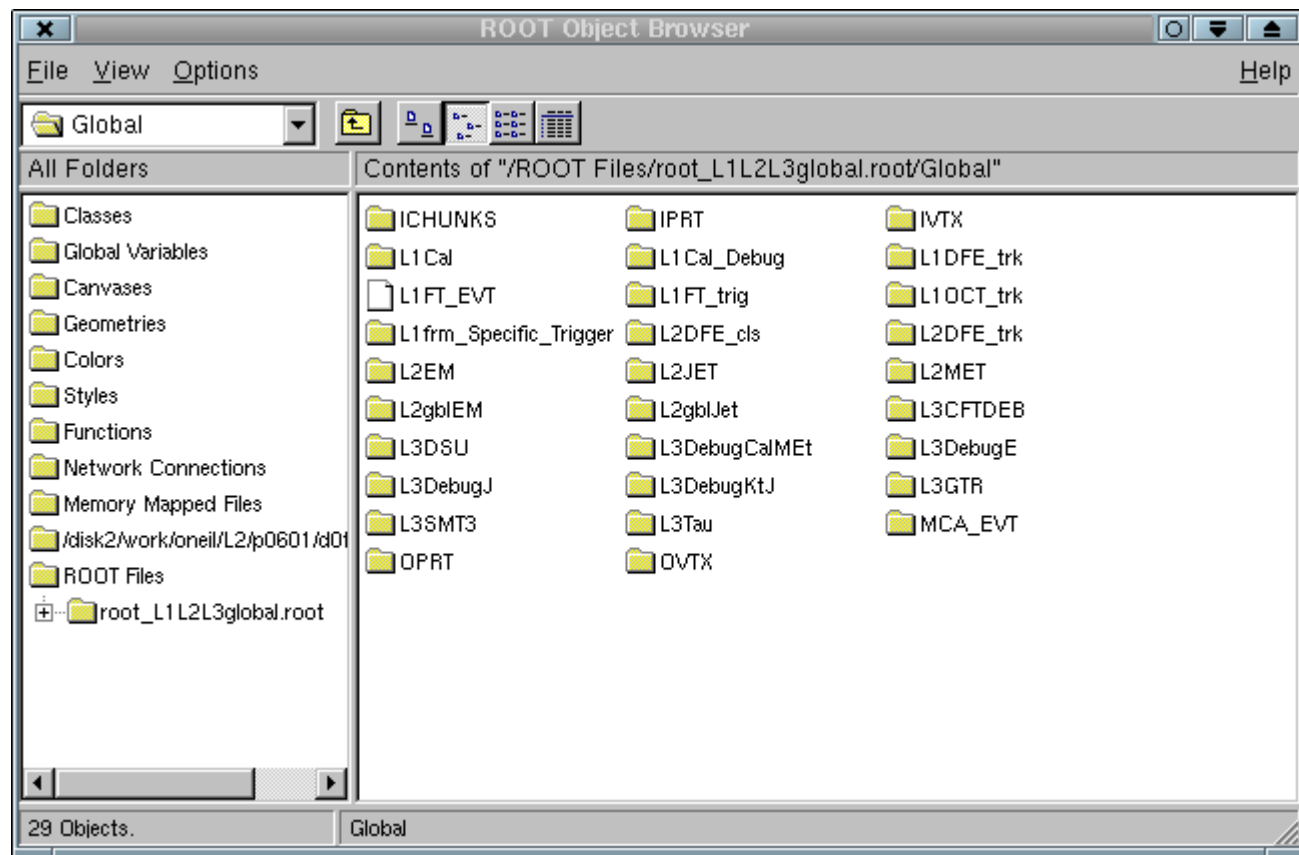
- See:

  `http://www-d0.fnal.gov/computing/trigsim/p06.00.01/p06.00.01.html`

  for known problems, fixes, instructions, ntuple variables, etc.

# Status of p06.00.01
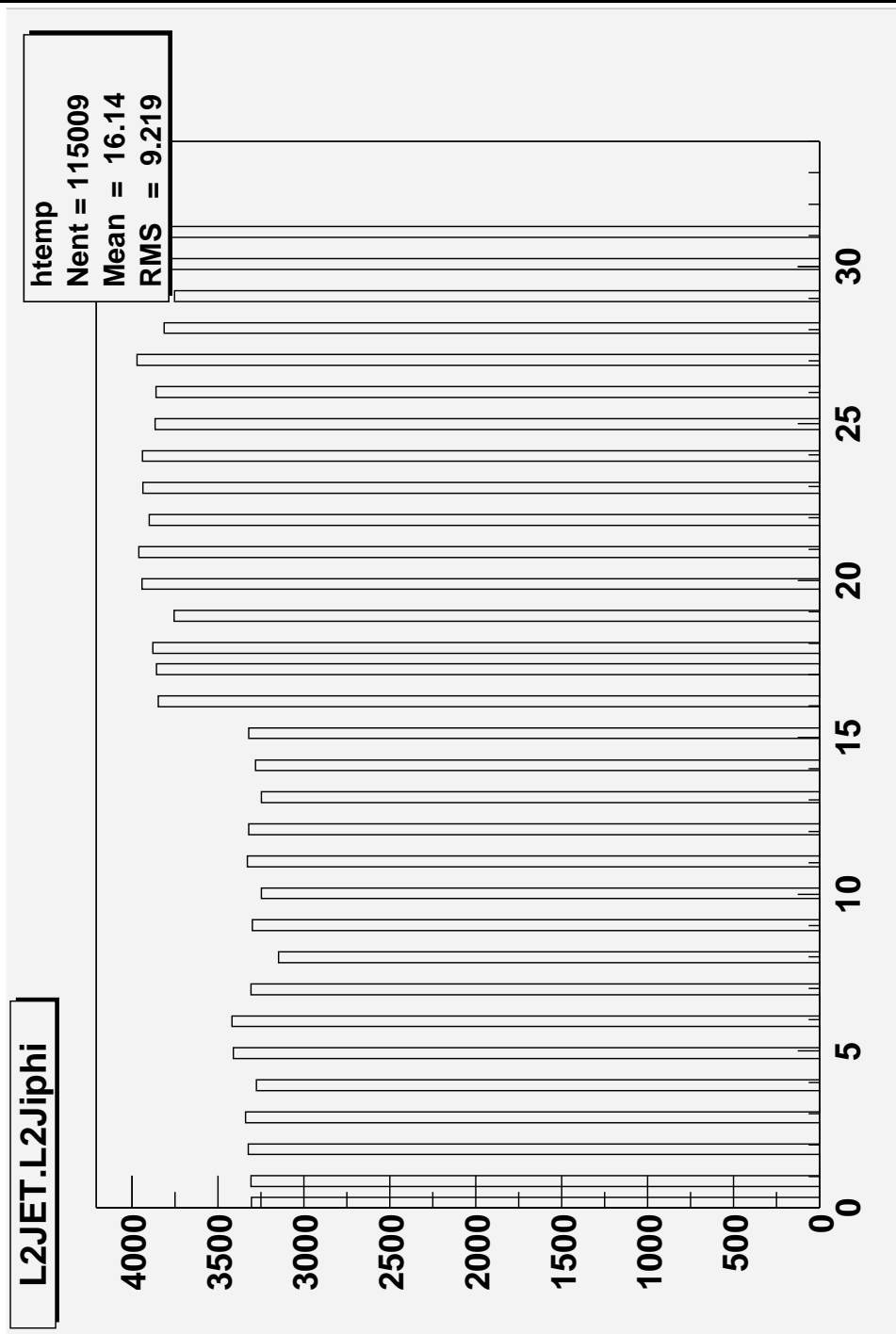
# Status of p06.00.01

- Simulator components output to common ROOT-tuple

# Status of p06.00.01

- **What works:**

  - MC information (mc_analyze)
  - L1 cal towers
  - L1 ft, cps info
  - L1 framework specific triggers
  - L2 cal preprocessor jets, met, electrons
  - L2 global jets
  - L2 global electrons
  - L3 cal met, cal jet, kt jet, electrons
  - L3 cft, global tracking, smt, tau

- **Sample of what is missing**

  - L1 muon ntuple output
  - L2 muon
  - L3 muon
  - L2 global filters/tools, L3 as well
  - pieces of infrastructure: eg. configuration via database/coor, L1/L2 communication with L3

# Status in p08.0x.00

- Expect p08.07.00 to work (p08.06.00 works without crashing), but STILL BEING TESTED.

- MANY changes beneath the surface since p06. Bug fixes for stability, and some major rewrites.

- d0trigsim is now part of mc_runjob. It will be possible to submit a job to the farms which goes from pythia to d0gstar to d0sim to d0trigsim. Appears to run in p08.06.00, still testing (thanks Dave Evans!!)

- Changes you can see:
  - Improvements to "funny" distributions
  - Genuine triggermeister-approved trigger list for L1 and L2
  - More outputs: eg. L1muon, more L2gbl
  - Better outputs: some improved analyze outputs

# Status in p08.0x.00
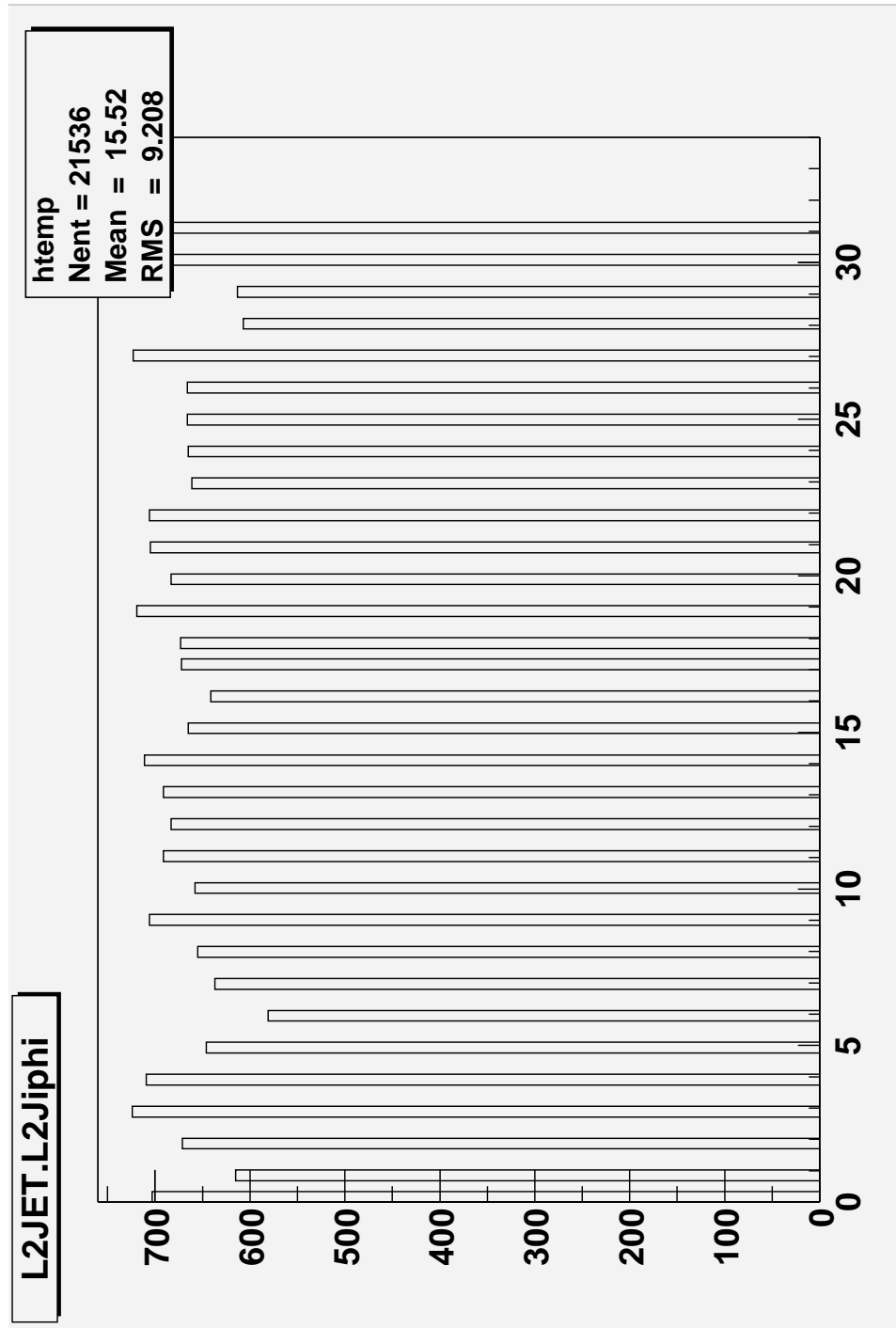
# The Future: p09 and Beyond

- The next d0trigsim production release will be p09. Last major improvements on April 16.

- Expect (minimum) in p09:

  - L2 Muon simulation

  - L2 global output of bitmask to RDC

  - analyze packages in L1/L2 run on RDC info, rather than "spying"....run on data

  - unpacker for L3 (or anyone else) to read L1/L2 info (if they want it)

  - working l2cttcftworker and analyze

  - many improvements to L3 (focused on online capabilities)

- Beyond (but not so far):

  - Unified L1/L2/L3 run summary (many common online/offline components). Work is underway.

  - More communication with database/coor.

  - l2stt integration

  - The usual: more filters, tools, etc. come online

# Problems with MC Inputs

- Output of d0sim is needed. Require events with RDC and calTT chunk only

- Prior to p07.00.01 (d0sim) there is a bug in cal trigger tower eta distribution in MC files. Large background samples for trigger studies were produced with earlier versions. Not much is out there for large studies.

- When working d0sim is available from p07.00.03 or later we need to request some QCD events for trigger studies.

# Running on Data

- We can do some of this now (eg. B. Kehoe has run trigsim on l1cal pulser data and looked at l1cal_analyze output)

- All systems run on datafiles containing only RDC....no special MC info required.

- Need to be able to run our analyze packages directly on raw trigger data either from simulator or real data. l1l2unpacker exists, analyze packages have begun to use it! Expect this functionality in p09.

- Need ability to simulate parts of system while using data for other parts (eg. simulate l1muon, use data for l2cal pp output to global). Requires some code changes. Will start after p09.

# Running on Data

- How will you be able to compare data and sim?

  - run trigsim on datafile, then MC file. Compare two outputs.

  - run analyze packages (only) on datafile or trigsim output. Compare outputs

  - run on datafile: "analyze trigsim analyze" to get ntuple output containing "data" branch and "sim" branch for each system.

  - keep two RDC, one from original data and one from trigsim. Compare bit-by-bit, event-by-event in dedicated analysis program

# Simulator Recipes

- coordinating package is d0trigsim

- steps (in a D0 code release area):

```
setup n32                       -|
setup D0RunII p08.07.00          |
setup d0cvs                      | generic stuff
newrel -t p08.07.00 mydir        |
cd mydir                         |
d0setwa                          |
addpkg d0trigsim                -|


cd d0trigsim/bin                -|
ln -s mydata inputfile           | running on disk file
Runme.sh                        -|

cd d0trigsim/bin                -|
edit Runme_sam.sh project name   | running on SAM data
Runme_sam.sh
```

- Configuration controlled via rcp runD0TrigSim.rcp. By editing this file you can turn on or off either L1/L2 or L3.

- It is also possible to run tsim_l1l2 or tsim_l3 directly (recipe similar to above, except link executable before running)

# Summary

- p06 has been in use since early February. Stable and useful.

- Physics studies have been hampered by lack of useful (for trigger simulation) MC samples. Should change soon as farms get new releases.

- p08 is starting to look healthy. New outputs available, some "physics" improvements, real trigger list.

- p09 (begins stabilizing in late May??) will contain improvements for running simulator or components on real data, improvements to L3, l2muon, etc.

- d0trigsim should allow many modes of running to for comparisons of sim to data.